COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF TELECOMMUNICATIONS AND ENERGY

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D.T.E. 02-38: Investigation by the Department
of Telecommunications and Energy
on its own Motion into Distributed Generation

COMMENTS OF PLUG POWER

INTRODUCTION

Plug Power Inc. (Plug Power) is a designer, developer and manufacturer of on-site energy generation systems utilizing proton exchange membrane fuel cells for stationary applications. Plug Power is based in Latham, New York with offices in Washington, D.C. and the Netherlands. Plug Power's fuel cell systems for small stationary applications have been delivered to select early customers including the Long Island Power Authority, the United States Army and DTE Energy Technologies and through GE Fuel Cell Systems, LLC, a joint venture between Plug Power and General Electric Company.

Plug Power applauds the Department for opening this investigation. Widespread development of distributed generation (DG) will be possible only if DG customers receive fair regulatory treatment that eliminates artificial barriers to entry. The continued development of advanced DG technologies such as fuel cells, wind and photovoltaics relies on the confidence of the financial community, which needs to see that a favorable regulatory environment exists for the deployment of DG.

In establishing regulatory relationships among DG customers and local distribution companies, Plug Power advocates for the elimination of artificial barriers but does not advocate for the creation of subsidies that would create disincentives for distribution companies to cooperate in the deployment of DG technologies. Local distribution utilities need to be partners in the deployment of DG, and regulatory relationships should be established in a manner that reconciles the potentially divergent interests of utilities and DG customers.

INTERCONNECTION

1. General Discussion

Interconnection is of particular importance to small DG, because the incremental transaction costs involved in the installation of a small DG unit can be disproportionately large. Under many of the interconnection regimes presently in effect in other states, the cost of interconnecting a 5 kW unit for a residential or small commercial customer will frequently exceed $1000, or $200 per kilowatt. In some cases, the cost of interconnection for a small unit, measured on a per/kW basis, may exceed the total capital cost of a large gas turbine. These high interconnection costs experienced by on-site generators do not reflect necessary costs; they reflect inefficient and uneconomic barriers to competition.

The artificial barriers presented by interconnection procedures can take many forms. System impacts, which in the case of small DG should be dealt with by a simple screening process, are frequently studied at considerable expense. System designs are studied and probed regardless of whether they have been pre-certified as meeting applicable technical standards. Unique technical standards may be imposed by individual states or individual utilities, for no compelling reason. Elaborate testing procedures may be required. Inexplicable delays may be experienced, with no effective recourse for the DG developer. The cost of dispute resolution, if necessary, is fatal to a small project, and provides distribution utilities with enormous leverage. Insurance requirements are often imposed.

Of these factors, the three most important are system review, design review, and testing requirements.

1. System review. Utilities have a concern that DG units exporting power onto the utility grid may have an adverse impact on the utility system. Where a small generation unit represents only a fraction of the load-carrying capacity of a feeder, these concerns are unreasonable and there is no justification for charging customers with the cost of system studies. This has been borne out by experience. Plug Power has completed over 200 successful interconnections of 5kw units, in six different states and three different countries, in both radial and network systems, under a wide variety of rules. These units have operated for over 360,000 hours with no adverse impact on distribution systems. The experience of Plug Power has been duplicated many times over by small wind and photovoltaic manufacturers, without any recorded incidents of safety or system problems, where proper equipment was used. Several states, including Texas, Ohio, Wisconsin, and New York (proposed rule) have acknowledged that in many cases small DG customers should not have to pay for system reviews.

2. Design review. Utilities have a reasonable concern that a DG unit must be disconnected from the utility system whenever the local grid is down. In order to accomplish this, interconnection packages must include an anti-islanding function. Where a DG interconnection package uses anti-islanding equipment that has been pre-certified by an independent laboratory as being in compliance with applicable technical standards, there is no need for an elaborate design review to be performed on each individual DG application. Pre-certification is absolutely necessary to make interconnection of small DG economically viable. But pre-certification only works if it allows the DG customer to avoid unnecessary utility review.

3. <u>Testing requirements.</u> Testing for a pre-certified anti-islanding interconnection package should be a simple matter of opening a manual disconnect switch to verify that the DG unit automatically disconnects when grid power is interrupted. In many instances, utilities insist on time-consuming and expensive tests that do nothing but repeat the procedures used in the pre-certification process.

<u>Uniformity in interconnection requirements is essential to the growth of small DG.</u> For small DG units, interconnection cannot be improvised on a case-by-case basis as it can with large generation units. A manufacturer of small DG units needs to be able to market a pre-certified "plug and play" package that can be interconnected without the need for individual studies.

At present a manufacturer of DG units for residential and small commercial markets faces a huge variety of interconnection regimes. For example, New York took the lead in adopting a streamlined process for units of 300 kW or less; this provides a relatively clear and predictable process, but a number of unreasonable cost barriers remain. The New York process is presently being reassessed and refined to address some of these barriers. Texas adopted interconnection guidelines for small units, which eliminate the need for expensive and unnecessary system reviews under many circumstances. Ohio and Wisconsin have also proposed guidelines that eliminate the need for system reviews. New York's reappraisal of its process is taking into consideration the actions of other states. Although the states appear to be slowly triangulating toward each other, at present there is no uniformity, and manufacturers of DG are not able to market a pre-certified "plug and play" package to customers throughout the country. For these reasons, Plug Power strongly urges the Department not only to adopt uniform guidelines for Massachusetts, but also to cooperate in the formation of uniform national standards.

<u>Interconnection procedures should apply to networks as well as radial systems.</u> In many cases, areas served by networks are located in congested load pockets, which is precisely where DG is most needed. A small DG unit proposing to serve a large customer with a portion of the customer's load may be unable to interconnect because a utility has a policy that it will not interconnect to networks. In most cases these concerns are groundless; Texas provides that DG units representing less than 25% of the load on a network require no system impact review.

Where the DG unit represents less than half of the minimum load of the customer, there is no practical chance for export and system review is unwarranted regardless of whether the customer is located on a network. A small generator, 5 kW for example, has the effect of removing two small residential branch circuits from a home's electric load (41.67 amps @ 120 volts).

2. Massachusetts-specific discussion

At the present time, Plug Power has not completed any interconnections with Massachusetts utilities. The following comments are conditioned by the fact that interconnection rules appearing reasonable on paper may prove otherwise in practice. Generally, the interconnection processes in Massachusetts compare favorably with those in many other states; however, there are a number of areas in which improvement is needed.

Certain interconnection processes in Massachusetts do not distinguish among small DG units and larger units. If small units are subject to the same level of scrutiny as larger units, both the cost and the delay of interconnection will render many projects infeasible. It is important that a streamlined process be available for units of 100 kW and smaller. Plug Power recommends that the DTE adopt interconnection processes, similar to those already in place with certain Massachusetts utilities, under which the unique characteristics of smaller DG units are recognized.

<u>Networks</u>. NSTAR forbids operation in parallel with a network system. Massachusetts Electric allows such operation only if a prohibitively expensive reverse power flow relay is installed, or if the DG unit represents less than one-fifteenth of the minimum load of the facility. Because areas served by networks tend to be those most in need of DG, these provisions present a significant barrier to DG. If there are unique problems created by parallel operation within a network, these should be fully explored. It is likely that these problems do not exist for small DG units of 100 kW or less; and it is certain that they do not exist where a small DG unit represents only a fraction of a customer's minimum load. This is a great opportunity for utilities to reduce loading on lines and transformers feeding network systems. As noted earlier, Plug Power has successfully interconnected units within a network, with no adverse impacts. A blanket prohibition of interconnecting within a network is overly conservative and will prevent the installation of DG where it is most needed.

<u>Timeliness.</u> The timelines established in 220 CMR 8 <u>et seq</u> apply equally to large and small DG units. Separate timelines should be established for smaller units. For a small unit with a pre-certified anti-islanding inverter, a 90-day period is far more time than is needed to complete an interconnection. Texas has adopted a rule for small units requiring interconnections within four (4) weeks and California's Rule 21 requires this in ten (10) days.

<u>Technical standards.</u> 220 CMR 8 <u>et seq</u> does not provide uniform technical standards. Massachusetts Electric provides simply that for static inverters, compliance with UL 1741 is sufficient. NSTAR's rule contains unique technical standards, although they are mostly consistent with UL 1741. In instances where national, technical standards already exist, such as UL 1741 for static inverters, these standards are more than adequate to protect utility systems and customers. The department is encouraged to adopt these

national standards for equipment where they already exist, in order to provide DG manufacturers with a needed, uniform set of technical standards under which to operate.

Inspection and testing. 220 CMR 8 et seq appears to provide that a Customer can interconnect a unit with the installation and testing by a qualified person, with the utility having the right to test or inspect at its own expense. This provision is very helpful in controlling unnecessary interconnection costs. It is not clear, however, whether the utility has the right to make the final interconnection dependent on the utility's own inspection and testing. NSTAR's interconnection rule does not allow final interconnection without testing and inspection by the utility, which could lead to undue delays. For example, one utility requires that test data for DG units be provided at least sixty (60) days prior to the date of interconnection. This time period is too long. One of the unique characteristics of small fuel cells is that the months or years required for conceiving, designing, construction and permitting a conventional centralized generation plant are not required. In the relatively near term the fuel cell industry expects that units will be fabricated, delivered and installed all within a matter of days.

Certification. NSTAR requires that a drawing be certified by an engineer registered in Massachusetts. This creates a barrier to manufacturers and distributors located in other states.

STANDBY RATES

For larger customers, whose rates tend to be determined on the basis of demand, properly designed standby rates represent an opportunity to save money for customers using DG. Properly designed standby rates will reflect the increased diversity among DG customers. Because it is highly unlikely that multiple DG units will be out of service at the same time, utility planners do not need to plan to serve all DG units simultaneously. The diversity factor for DG units is high. For this reason, large DG customers should pay lower demand charges than comparable customers without DG.

In marked contrast to demand-billed customers, small customers whose rates are determined based on kilowatt-hours can suffer tremendous adverse impacts from standby rates. Standby rates, applied to a non-demand-billed customer, will typically cause a large increase in monthly fixed costs.

Standby rates should not be established for non-demand-billed customers. This class is so diverse that variations in usage may be much greater for many full-service customers than they will be for DG customers. For example, many residential customers are absent from their homes for months at a time. Vacation homes may be used very infrequently. Small businesses that use power machines may have dramatic spikes in volume on an unpredictable basis. The times at which any of these customers may suddenly place their peak demands on the system are unpredictable by utilities.

Rate design applicable to small customers accommodates a wide range of usage patterns. Variations in usage by a small customer employing distributed generation could easily fit within the range of variations defined by full-service customers. It would be counterproductive to separate out DG customers for disparate rate treatment that would have the effect of discouraging DG use.

Standby rates for non-demand-billed customers would also work against the goal of reducing overall electrical demand. Increasing fixed charges and reducing volumetric charges would reward high-usage customers and remove incentives for them to reduce their usage of electricity. Customers presently using more than the average for their class would benefit; customers using less than the average would pay more. Transforming distribution rates for all customers into fixed monthly charges that are not sensitive to usage would drastically change the economics of energy efficiency and conservation. This would lead to higher usage and thus higher energy costs for all customers.

Where standby rates for small DG customers are established, the system benefits provided by small DG must be accounted for. Most important, distributed generation reduces the marginal price for wholesale power that is paid by all customers. Large generators may have the option of participating in wholesale markets, in order to take advantage of high marginal prices. Smaller units have no such option, and the benefit that they provide to all customers is not presently accounted for anywhere within the pricing system. In other words, small self-generators provide a wholesale price benefit to all customers using the system, but under existing pricing structures small self-generators do not receive a price incentive commensurate with the system benefit that is provided.

DG can also result in substantial cost savings to the operator of a distribution system. These savings may include reduced need for capital upgrades, line loss reductions, and reactive power. Local power quality benefits occur where a DG unit relieves pressure on a feeder that has been experiencing frequent voltage dips.

UTILITY PARTICIPATION

Utility participation in distributed generation can take several forms. When a utility is considering a capital investment to upgrade or reinforce distribution facilities, the utility should examine whether distributed generation can meet the utility's needs at a lower cost. This can be accomplished by the utility making a direct investment in DG technology, providing it to selected customers on the same terms as regular utility service, and recovering costs through the rate base. It can also be accomplished through an auction process, which should be open to aggregated small DG.

In areas where distribution service is congested and customers are experiencing frequent outages, a utility can offer incentives to customers that install DG. This would place DG on a footing similar to demand-side management programs.

OTHER ISSUES: GAS TRANSPORTATION RATES

The Department should consider whether DG customers using natural gas technologies should pay reduced volumetric rates for natural gas used to fuel DG systems. Typical fuel cell customers will increase gas usage by 75%, and the increase will be weighted toward summer months. In northern states where gas is a winter-peaking commodity, DG offers the potential to improve the efficiency of the gas transportation system.

At this time, Plug Power plans to market fuel cells in sizes ranging from 5kw to 100kw. A 5 kW fuel cell will consume 150 – 250 Mcf per year under anticipated usage patterns, which will double the total gas usage of the typical customer. Heat savings from combined heat and power applications (CHP) will represent approximately 25%, resulting in an overall net increase in gas usage of approximately 75%. This increase will be weighted toward summer months, when the electric capacity factor of the DG units is expected to be at its highest. This large and seasonably variable increase in gas volume represents an excellent opportunity for gas utilities to fill demand valleys and make more economic use of their transportation systems.

Assuming that existing rates represent a fair allocation of costs, the average small customer is presently paying its equitable share of utility embedded costs. A DG customer will increase gas usage and, in almost every case, will greatly exceed the average usage levels. The increased usage of DG customers will not be offset by any decrease in usage by other customers. Therefore, from the standpoint of cost allocation, a DG customer should pay a sharply reduced volumetric rate for gas transported during off-peak months.

CONCLUSION

Distributed generation offers great potential to improve the efficiency of both the electric system and the gas transportation system. Even-handed regulatory treatment is needed to ensure that the potential of DG can be realized. The unique characteristics of smaller DG units should be accounted for when regulatory policies for distributed generation are developed.

Respectfully submitted,

Gerard L. Conway, Jr.
Director, Government Relations
Plug Power Inc.
968 Albany Shaker Road
Latham, New York 12110
518 782 7700 ext. 1970
gerard_conway@plugpower.com